



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: NON-HALOGENATED INTUMESCENT COMPOSITIONS			
(57) Abstract			
<p>A non-halogenated intumescent composition comprising a carrier ingredient and an intumescent ingredient can be formed into elongate strips (e.g. by extrusion) for use as fire seals. The intumescent strip may optionally be held within a cover-member, the cover-member constituting either a housing for the strip or a skin integral with the strip. A smoke seal, weatherstrip or the like may be attached to a surface of the strip or of the cover-member.</p>			

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**NON-HALOGENATED INTUMESCENT COMPOSITIONS**

This invention relates to non-halogenated intumescent compositions and to articles made therefrom.

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When an intumescent material is subjected to heat and/or flame, the material swells to form a foam-like charable material. Under the continued action of the heat and/or flame, the outer layer sets to a rigid char, isolating the material below the char and preventing further combustion.

10

However, many known compositions which include intumescent materials have been found to evolve toxic products of decomposition when subjected to heat and/or flame.

15

Thus, the occupants of a building in which there is a burning article made from an intumescent composition may be more at risk of poisoning from inhaling the products of the combustion than of physical injury caused by burns.

20

Furthermore, many countries have introduced legislation to restrict the level of toxic emissions into the environment, while other countries intend to do so in the foreseeable future.

25

We have found that the use of non-halogenated materials to make intumescent compositions minimises such toxic emissions when the compositions and articles made therefrom are subjected to heat and/or flame.

Accordingly, the present invention provides a non-halogenated intumescent composition, said composition consisting essentially of (a) a carrier ingredient and (b) an intumescent ingredient.

5        Suitably, the carrier ingredient (a) is a non-halogenated thermoformable plastics material, for example ethylene vinyl acetate copolymer. Other suitable materials include polyethylene, polypropylene, polystyrene, polyvinyl acetate, polyacrylonitrile, natural rubber, styrene butadiene rubber, acrylonitrile styrene butadiene rubber, ethylene octylene, 10 ethylene propylene rubber and ethylene propylene diene monomer rubber. Thermoformable polyester-, polyamide-, epoxy- and phenolic resins may also be used as the carrier ingredient (a).

The intumescent ingredient (b) may be, for example, graphite. 15 Alternative intumescent ingredients include alumino-silicate-based materials such as vermiculite.

The intumescent composition may, if desired, contain an effective amount of one or more non-halogenated flame-retardant additives (c). 20 Examples of such additives include hydrous aluminium oxide, red amorphous phosphorus and other phosphorus compounds, such as ammonium mono-phosphate or an ammonium poly-phosphate.

The present invention also provides an article made from a 25 non-halogenated intumescent composition, said composition consisting essentially of a carrier ingredient and an intumescent ingredient, in which the article comprises an elongate strip, wherein said carrier (a) and said intumescent ingredient (b) have been compounded together prior to forming of the strip.

Compounding may be carried out, for example, by means of an internal mixer, an open mill or an extruder-compounder.

The forming of such an elongate strip may be achieved by any  
5 processing method compatible with the intumescent composition.

A particularly preferred method is the extrusion of the intumescent composition through a suitably-configured die to form an elongate strip.

10 Such a strip may be used as a fire seal for doors and/or windows.

To the extent that other processing methods are compatible with the intumescent composition, articles according to the present invention might, for example, be made by calendering, coating or vacuum-moulding.

15 Clearly, the composition must contain a sufficient amount of the intumescent ingredient to provide acceptable protection in a fire situation. The amount of the intumescent ingredient (b) may be, for example, present in the composition in an amount of 5 - 60%, preferably at least 30% and  
20 especially at least 39%, by total weight of the composition.

In a further embodiment of the present invention, a cover-member is provided to at least partly enclose the intumescent strip.

25 Accordingly, the present invention further provides an intumescent article comprising a cover-member which is adapted to at least partly enclose an elongate strip of a non-halogenated intumescent composition.

30 The cover-member may, for example, constitute a housing having an integral cavity to contain the elongate strip. The cover-member may itself

constitute a decorative outer surface for the intumescent article or it may have decorative or instructional matter applied thereto.

Alternatively, the cover-member may constitute a skin which at least  
5 partly encloses the intumescent strip.

The cover member may be made of a rigid plastics material or of a flexible plastics material. These plastics materials may also be non-halogenated. The elongate strip preferably has a rectangular cross-section,  
10 and the cover member extends round three sides of the strip.

Intumescent articles according to the present invention may further be provided with a smoke seal, weatherstrip or similar sealing-member (hereinafter "weatherstrip") which is attached to the outer surface thereof,  
15 for example where the article is to be affixed to the frame of a door - or window - aperture.

The weatherstrip may conveniently be attached directly to an outer surface of the intumescent strip, or to an outer surface of the skin, or to an  
20 outer surface of the cover-member.

Attachment of the weatherstrip may be achieved by fusion-welding, by ultrasonic welding, or by means of a suitable adhesive.

25 By way of illustration, an intumescent article according to one embodiment of the present invention comprises an elongate strip of an intumescent material enclosed in a flexible skin and having a weatherstrip (as hereinbefore defined) attached to the outer surface of said skin.

30 Such an article may be made as follows:

A strip of non-halogenated intumescent composition and skin are formed by co-extrusion and the extrudate is then cooled to ambient temperature. For example, the strip is of rectangular cross-section, and the  
5 skin is extruded to cover three sides of the strip. An elongate portion of the outer surface of the skin and a correspondingly-shaped portion of the outer surface of a weatherstrip are simultaneously heated to a sufficient temperature to tackify the said surfaces. The surfaces are then brought together to form a continuous permanent joint. The article (comprising the  
10 intumescent strip with its attached weatherstrip) is then cut into discrete lengths, which may be coiled for convenient storage.

**CLAIMS**

1. A non-halogenated intumescent composition, characterised by (a) a carrier ingredient and (b) an intumescant ingredient.
- 5 2. A composition according to claim 1, characterised in that the carrier (a) is a non-halogenated, thermoformable plastics material.
- 10 3. A composition according to claim 1 or 2, characterised in that the carrier (a) is an ethylene/vinyl acetate copolymer.
- 15 4. A composition according to claim 1 or 2, characterised in that the carrier (a) is polyethylene, polypropylene, polystyrene, polyvinyl acetate, polyacrylonitrile, natural rubber, styrene/butadiene rubber, acrylonitrile/styrene/butadiene rubber, ethylene octylene, ethylene/propylene rubber or ethylene/propylene diene monomer rubber.
- 20 5. A composition according to claim 1 or 2, characterised in that the carrier (a) is a thermoformable polyester-, polyamide-, epoxy- or phenolic resin.
6. A composition according to any one of claims 1 to 5, characterised in that the intumescant ingredient (b) is graphite.
- 25 7. A composition according to any one of claims 1 to 5, characterised in that the intumescant ingredient (b) is an alumino-silicate-based material, for example vermiculite.

8. A composition according to any one of claims 1 to 7, characterised in that it additionally contains an effective amount of one or more non-halogenated flame-retardant additives (c).

5 9. A composition according to claim 8, characterised in that the additive (c) consists essentially of hydrous aluminium oxide or red amorphous phosphorus.

10. 10. A composition according to claim 8, characterised in that the additive (c) consists essentially of ammonium mono-phosphate or an ammonium poly-phosphate.

11. 11. A composition according to any one of claims 1 to 10, characterised in that the intumescent ingredient (b) is present in an amount of 5 to 60% by total weight of the composition.

12. 12. A composition according to claim 11, characterised in the ingredient (b) is present in an amount of at least 30%, for example at least 39%, by total weight of the composition.

20

13. An article made from a composition according to any one of claims 1 to 12, characterised in that it comprises an elongate strip wherein said carrier (a) and said intumescent ingredient (b) have been compounded together prior to forming said strip.

25

14. An article comprising an intumescent strip made of non-halogenated intumescent composition formed by a carrier ingredient and an intumescent ingredient compounded together and formed into an elongate strip.

15. An article according to claim 13 or claim 14, characterised by a cover-member which at least partly encloses said elongate strip.

16. An article according to claim 15, characterised in that the cover member constitutes a skin which at least partly encloses said elongate strip.

17. An article according to claim 15, characterised in that the cover-member constitutes a housing having an integral cavity to contain said elongate strip.

10 18. An article according to any of claims 15 to 17, characterised in that the cover-member is made of a flexible plastics material.

15 19. An article according to any of claims 15 to 17, characterised in that the cover-member is made of a rigid plastics material.

20 20. An article according to any of claims 13 to 19, characterised in that a smoke seal, weatherstrip or the like is attached to an outer surface of the elongate strip or to an outer surface of the cover-member.

25 21. An article according to claim 20, characterised by an elongate strip of an intumescent material enclosed in a flexible skin and having a smoke seal, weatherstrip or the like attached to the outer surface of said flexible skin.

22. An article according to any of claims 15 to 21, characterised in that the elongate strip has a rectangular cross-section, and the cover-member extends round three sides of the strip.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 98/00048

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 C09K21/14 E06B5/16

According to International Patent Classification(IPC) or to both national classification and IPC:

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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